



### Homework 5 Bitwise manipulation and masks

1. Figure 1 shows a byte containing a signed integer. The value of the carry bit is unknown.

1	1	0	1	1	0	1	0	<input type="checkbox"/> carry bit
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Figure 1

Show the result of performing the following shifts, starting each time with the byte given in Figure 1. [4]

(a) a logical right shift of  carry bit

(b) a logical left shift 1:

(b) an arithmetic left  shift 1:

(c) an arithmetic right  shift 2:

2. Using a combination of shifts and addition, multiply 17 by 7 [3]

3. Figure 2 shows an 8-bit byte containing a bit pattern controlling 8 lights.

0	1	0	1	0	1	0	1
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Figure 2

(a) It is desired to set switches 1- 4 to 0 without altering the other switches. Show how this can be done with a mask and a logical operator. [2]

Switch number	1	2	3	4	5	6	7	8
Current state	1	1	0	1	0	1	1	1

(b) It is now desired to reset the bits to all 1s, except for bit 8, which should be left as it is. Show how this can be done with a mask and a logical operator. [2]

Switch number	1	2	3	4	5	6	7	8
Current state	0	0	0	0	0	1	1	1



5. The ASCII codes for the uppercase letters A - Z are 0100 0001 to 0101 1010. The lowercase letters a - z are represented in ASCII by 0110 0001 to 0111 1010. Use a mask and a logical operator to transform an uppercase letter to lowercase. [2]

code for A	1 2 3 4 5 6 7 8
	0 1 0 0 0 0 0 1

Total 13 marks